

classes 3 and 4) is not appropriate if the mitral valve can be repaired. Nowhere in the text of our article will the reader find a sentence stating, "Patients with asymptomatic mitral valve incompetence are candidates for surgery," as written in Dr Shuhaiber's letter. In fact, in the last paragraph in the discussion of our article, the reader will find the following¹: "In conclusion, surgical intervention should be considered in asymptomatic patients with severe MR caused by floppy valves if valve repair is feasible, and it can be done with low operative mortality and morbidity because the late survival is identical to that of the general population."

And the paragraph before the last reads as follows¹: "This is a retrospective study of a clinical experience of a single surgeon, and the results might to be generalizable. The prevalence of associated cardiac and non-cardiac diseases was relatively small in this series, and statistical values of certain variables might have been altered by chance alone."

We believe our conclusion was far softer than implied in the letter. However, we agree that a controlled randomized trial is needed to determine the appropriateness of mitral valve repair for symptom-free patients with normal left ventricular function.

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Esophageal perforation during left atrial radiofrequency ablation

To the Editor:

Doll and colleagues¹ reported an esophageal perforation incidence of 1% (4/387) after left atrial ablation with intraoperative radiofrequency ablation for atrial fibrillation. Risk factors could not be identified; therefore, they recommended against the use of intraoperative radiofrequency ablation for atrial fibrillation. In our opinion, however, a combination of various factors—such the device, the handling of device, the application time, the lesion pattern, and the surgical access—contribute to this complication, rather than the mere use of radiofrequency.

Doll and colleagues¹ used temperature-controlled radiofrequency ablation with a 10-mm T-shaped rigid ablation probe (Radios 504; Osypka GmbH, Grenzach, Wyhlen, Germany) targeting a temperature of 60°C for 20 seconds for each lesion without taking the variability of the local atrial wall thickness into account. This catheter has a temperature overshoot, which proved to be a concern in terms of safety and rapidity of feedback control. Excessive tissue temperature could result in necrotic perforation.² It is the overlap between two linear ablation lines where excessive tissue heating can occur. The Leipzig group did not mention this in their publication. The Leipzig group performed these procedures through a right lateral minithoracotomy; therefore, dissection of the doom of the left atrium was probably not done. Thus the relation ship between the left atrium and the esophagus was intense.

Several surgical centers have used temperature-controlled radiofrequency without reporting any esophageal or circumflex arterial injuries (Table 1). However, differences in technique can be distinguished.

All centers used a standard sternotomy. Williams and coworkers⁴ used a flexible ablation probe with seven consecutive electrodes (Cobra; Boston Scientific-EP Technologies, La Garenne Colombes, France), each independently regulated by the generator targeting an even higher temperature (70°C-80°C) and longer application time (1 minute) per lesion than used by Doll and colleagues.¹ Energy delivery was flexible but still up to 150 W. Ablation lesions were either made as separate ovals around the left and right orifices or as a complete circumferential island around all four pulmonary orifices. Nevertheless, Williams and coworkers⁴ did not report any injury, nor did Benussi and associates⁵ and Melo and colleagues,⁶ who also used temperature-controlled radiofrequency in a combined cohort of 105 patients.

In our own series of 124 patients treated with irrigated radiofrequency,⁹ the 30-day mortality was 4.8% (6/124). The causes of death were cerebral stroke (n = 1), atrio-ventricular dehiscence (n = 1), cardiac failure (n = 1), and low cardiac output (n = 3). Autopsies did not reveal any esophageal, pulmonary orifice, or circumflex arterial injuries. Neither were such injuries seen by Sie and coworkers⁷ in a series of 122 patients. We used a handheld, flexible pen catheter (Cardioblate; Medtronic Inc, Minneapolis, Minn). Formation of yellow-white blistering endocardial lesions, induced by oscillating catheter movements, were considered sufficient. Stable catheter-tissue contact was preserved without pressing the atrial wall against adjacent mediastinal structures.

We therefore believe that the cause of the reported complication was the use of a rigid T-shaped temperature-controlled radiofrequency ablation probe pressed against the atrial wall, which was not dis-

TABLE 1. Results of selected series

Reference	Esophageal injury	Circumplex arterial injury	Sinus rhythm (%)	30-d Mortality (%)
Mohr et al ³	1% (4/387)	0.4% (1/234)	67-78	6.4 (15/234)
Williams et al ⁴			81	12.5 (6/48)
Benussi et al ⁵			77	2.5 (1/40)
Melo et al ⁶			54	0 (0/65)
Sie et al ⁷			72	4.1 (5/122)
Gueden et al ⁸			71-95	3.2 (2/62)

sected from the adjacent cardiac structures, with preset power and application time irrespective of the atrial wall thickness, especially when overlapping ablation lines were created. The mere use of radiofrequency was not responsible.

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Reply to the Editor:

Laczkovics and colleagues have proposed that the 4 cases of esophageal perforation reported in our recent publication¹ were the result of a combination of factors unique to our clinical practice, rather than a result of unipolar radiofrequency in and of itself. They have suggested several possible explanatory variables, which we will address in sequence. First, they suggest that our radiofrequency ablation probe was susceptible to temperature overshoot. It is important to stress that we vigilantly monitored probe tip temperature at all times during these procedures to avoid exceeding our target temperature. It should also be stressed that our esophageal perforations occurred despite a lower target temperature (60°C) than that used by other investigators. In addition, other groups have reported esophageal perforations with different unipolar radiofrequency probes than the one we used.^{2,3} It may be true that irrigated radiofrequency probes result in a lower risk of esophageal complications, but more data and experience are required. Second, Laczkovics and colleagues suggest that we did not adequately account for atrial wall thickness in our patients. Although we agree that this may be an important variable, we also believe that atrial wall thickness is difficult to quantify and highly variable, even within patients, thereby making use of this information difficult. Third, they suggest that our esophageal complications were due to the right lateral minithoracotomy and lesion line pattern that we used. It is true that all of our complications occurred after minimal access surgery. However, others have reported these same complications after standard median sternotomy and after using a set of atrial lesion lines that were different from the one we described.^{2,3} It should also be noted that we attempted to avoid overlapping of lesion lines at all times.

Laczkovics and colleagues point to several case series in the literature without esophageal perforations as evidence that our described complications are institution specific. It is worth noting, however, that our publication represents the largest reported series to date, and therefore more complications may be reported as more experience is gained. In addition, our report demonstrated that patients who die of sudden stroke after ablation surgery may have

an undiagnosed atrioesophageal fistula. This catastrophic complication may therefore be underreported in the literature. It is also worth noting that other complications of atrial fibrillation ablation surgery are being described as more experience is gained. Manasse and associates⁴ recently reported the case of a patient who had left main coronary stenosis develop after microwave epicardial ablation.

We have not, as Laczkovics and colleagues suggested, recommended against the use of all radiofrequency ablation techniques. We concluded that unipolar radiofrequency ablation "is associated with a small but definite risk of esophageal perforation" and that a "high degree of vigilance must be maintained" to avoid and detect this dreaded complication.¹ Other types of radiofrequency ablation, particularly bipolar radiofrequency, may significantly lower the risk of damage to collateral tissue structures. However, we must continue to watch for and report complications associated with these atrial fibrillation surgical devices and procedures, which are rapidly escalating in popularity.

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